Amendments to the Specification:

Please insert the following Abstract::

ABSTRACT

The invention is a method of estimating, from data obtained by exploration of a zone of a heterogeneous medium, a model representative of a distribution, in the zone, of at least one physical quantity, the model being free of a presence of correlated noises that may be contained in the data which has application to determining the distribution in an underground zone of acoustic impedance, propagation velocities and permeabilities, etc. The method includes acquiring measurements giving information about physical characteristics of the zone; specifying a noise modelling operator which associates, with a model of each physical quantity, synthetic data that constitute a response of the model; selecting a noise modelling operator which associates a correlated noise with a noise-generating function belonging to a predetermined space of the noise-generating functions; specifying a norm or of a semi-norm in the data space; specifying a semi-norm in the space of the noise-generating functions; defining a cost function; and adjusting the model and of the noise-generating functions.

In the Substitute Specification, pages 9-10, please replace paragraph [0019] as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]   Other features and advantages of the method according to the invention will be clear from reading the description hereafter of an embodiment given by way of non

2

limitative example, with reference to the accompanying drawings wherein:

Fig. 1 shows an example of data obtained by means of a vertical seismic prospecting method (VSP),

Fig. 2 shows a model of distribution of the acoustic impedance with depth,

Fig. 3 shows synthetic VSP data obtained on the basis of the impedance model of Fig.2,

Fig. 4 shows an example of VSP data contaminated by a single correlated noise,

Fig. 5 shows an example of VSP data contaminated by two correlated noises,

Fig. 6 shows the impedance distribution as a function of depth, obtained by inversion of the noise-containing data of Fig.4,

Fig. 7 shows the inversion residues (differences between the data of Fig.4 and the seismic response of the model of Fig.6),

Fig. 8 shows the impedance distribution as a function of depth, obtained by inversion of the noise-containing data of Fig.5,

Fig. 9 shows the corresponding inversion residues (differences between the data of Fig.5 and the seismic response of the model of Fig.8),

Fig. 10 shows the impedance distribution as a function of depth, obtained by inversion of the noise-containing data of Fig.4 by seeking the correlated noise in a form of the superposition of two correlated noises having inaccurate propagation properties, that is different from those of the noise appearing in the data of Fig.4,

Fig. 11 shows the corresponding inversion residues (differences between the data of Fig.4 and the seismic response of the model of Fig.10),

3

Figs. 12A and 12B respectively show seismic data with multiple reflections and the seismic response of the model obtained after conventional linearized inversion,

Figs. 13A and 13B respectively show an example of impedance distribution and of propagation velocity for which the seismic data of Fig.12A constitute the seismic response, ~~and~~

Figs. 14A and 14B respectively show the comparison of the seismic responses of the models obtained by conventional inversion (Fig. 14A) and by inversion according to the proposed method involving picking of the moveout of the multiple and an estimation of the amplitude variations with the offset (Fig. 14B)~~.~~, and

Fig. 15 is a block diagram of a method of estimating, for data obtained by exploration of a zone of a heterogeneous medium, a model representative of a distribution, in the zone, of at least one physical quantity, the model being free of a presence of correlated noises that may be contained in the data.

Please replace paragraphs [0121]-[0122] as follows:

[0121] Figure 14B shows the results obtained (seismic response of the solution model) by implementing the method when function g(x) is selected in a very simple form (affine function). T he i mprovement i n r elation t o t he c onventional i nversion r esult can be observed (Fig.14A).

[0122] A method of estimating, from data obtained by exploration of a zone of a heterogeneous medium, a model representative of a distribution in the zone, of at least on physical quantity, the model being free of a presence of correlated noises that may be contained in the data is illustrated in Fig. 15. The method begins at starting point

4

100 and proceeds to point 102 where acquiring measurements giving information about physical characteristics of the zone by following a predetermined experimental protocol occurs. The method proceeds to point 104 where specifying a noise modelling operator which associates, with a model of each physical quantity, synthetic data that constitutes a response of the model, the measurements and the synthetic data belonging to a data space occurs. The model proceeds to point 10 where selecting, for each correlated noise referenced by a subscript j ranging from 1 to j, a noise modelling operator which associates a correlated noise with an noise-generating function belonging to a predetermined space of the noise generating functions (b_j) occurs. The method proceeds to point when specifying a norm or of a semi-norm on the data space as specified at point 108. The method proceeds to specifying a semi-norm in the space of the norm-generating functions for which noise modelling operator establishes substantially an isometric relation between the space of noise-generating functions and the data space occurs. The method proceeds to point 112 where defining a cost function qualifying a difference between the measurements on one hand and a super position of a model response and of the correlated noise associated with the noise-generating functions occurs. The method proceeds to point 114 where adjustment of the model and of the noise-generating functions by minimizing the cost function, by means of an algorithmic method taking advantage of isometry of properties of the noise generated noise modeling operators occurs.

[0122] [0123] Implementation examples where the physical parameter whose subsurface distribution is modelled is the acoustic impedance have been described. It is clear that the method, in its most general definition, can be applied for seeking the

distribution of physical quantities affected by correlated noises in any heterogeneous medium.